REMARKS

Claims 1-16 and 19-21 are pending. On March 29, 2006 Applicants elected to prosecute the invention of Group 1, claims 1-16, and with traverse claims 19 -21. The action of April 11, 2006 withdrew claims 19-21 from consideration. By this Amendment claims 1, 3, and 10 are amended and claim 22 is added.

35 U.S.C. § 112

The Examiner stated that claims 14-16 were rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the enablement requirement. The Examiner notes that in the instant claims, the steps of manufacturing an aircraft from aircraft components are not described in the specification. It is submitted that to meet the "enablement" requirements of 35 U.S.C. § 112, the specification need only provide that information which is necessary to enable the skilled reader to perform the invention. The specification does not need to be so descriptive as to tell the skilled reader that which he already knows from his common general knowledge. MPEP 2164.01. The person skilled in the art would understand that there are many ways to manufacture an aircraft component and an aircraft and that any of them would be sufficient in order to practice the invention of claims 14-16. The principle difference as between the invention of claims 14-16 and the manufacturing techniques of the prior art is that in accordance with the present invention, the block of material from which the component is machined is formed in a different way.

Moreover, the Examiner is directed to paragraph 0066 and Figure 6 of the published application, where an embodiment of the invention is used to join two billets of aluminum alloy

to form a block of material from which a spar for an aircraft wing is machined. Aircraft components are often machined from solid blocks of material in this way. One skilled in the art needs no further information than that which is provided in order to perform the invention. It is furthermore clear from the specification that aircraft components other than spars may be similarly manufactured (See paragraph 0067).

The Examiner also stated that claims 1-8 and 10-16 were rejected under 35 U.S.C. § 112, second paragraph, as indefinite with regard to "performance." Claims 1 and 10 have been amended to overcome this rejection. Likewise claim 3 is amended to overcome the cited rejection based on "the grain size number."

35 U.S.C. § 102(b)

The Examiner rejected claims 1-4 and 6-16 under 35 U.S.C. § 102(b) as anticipated by Forrest et al. (U.S. Patent No. 6,398,883). Applicants respectfully traverse the Examiner's reliance on Forrest. Forrest discloses an assembly constructed from structural members having enhanced strength, toughness and fatigue resistance in those regions subjected to comparatively high operational stress [Col. 13, lines 43-48]. Operational stress is defined as static and cyclic loads, environmental conditions, temperature variations and severe acoustic and vibration environments [Col 5, line 63 – Col. 6, line 1]. Forrest describes first identifying regions bearing comparatively high operational stress and then treating them by friction stir welding (FSW) [Col. 3, lines 15-24; Fig. 16, blocks 61-65] Thus Forrest does not disclose a method for welding together two metal work-pieces.

The independent Claims 1, 9, 10 and 22 as currently presented each require that

(i) as a preparatory step, a portion of each workpiece is subjected to a surface treatment (preferably including a FSW) that results in a region having a refined grain structure (see Figures for example 1b and 1c and paragraph 0053 of the specification as published); and

(ii) thereafter (i.e. *after* the preparatory step) the workpieces are fusion welded together by joining the previously prepared portions (see for example paragraph 0055 of the specification as published).

Thus grain refinement (for example by using FSW) is conducted as a *preparatory* treatment *before* fusion welding of an area to be joined together. Treating the metal in the region of a joint that is to be welded (i.e. before it has been welded), has been found to mitigate the problems associated with the formation of cracks that result from the welding process (see paragraph 0009 of the specification as published).

Contrary to the rejection, Forrest is not focused on joining two work-pieces. Forrest provides "[a]fter mixing the region of the structural member having the comparatively high operational stress, the structural member can be machined to a corresponding pre-selected shape and thickness." [Col. 3, lines 40-43] Mechanically joining work-pieces is then disclosed. Forrest suggests welding together structural members as an alternative to the fasteners 12 used in the embodiment illustrated by Figure 1 [Col. 5, lines 45-47]. Figure 1 discloses joining parts of the structural members that have not undergone any grain refinement (those regions 16 being limited to the web portions of the member 11). Forrest does not require treatment of the areas to be welded.

Fusion welding is also disclosed by Forrest but as a means to join an insert to the structural member (the embodiment illustrated by Figure 15 - see column 11, lines 27 to 56). Thus, the insert is first joined to the structural member by a fusion weld joint 52 and *then* in order to "compensate for increased operational stress due to grain size discontinuity" in the region of the fusion weld, the structural member 51 and insert 51b are mixed with a rotating FSW probe 18 adjacent to, and along the path of, the weld joint 52 to define one or more elongate regions 16 of locally refined grain structure.

Forrest does not suggest or teach refining the grain structure of the workpiece surfaces to be joined *and then* joining the two workpieces by means of fusion welding together the respective refined workpiece surfaces. It would moreover appear that Forrest teaches away from the present invention by leading the skilled person to fusion weld first and then use friction stir welding afterwards to reduce the stress rises created by the fusion welding of one workpiece to another. Thus, not only is the subject matter of Claims 1, 9, 10 and 22 not anticipated by Forrest they are not obvious from Forrest.

Forrest does not teach that *each* work-piece undergoes the FSW preparatory treatment. Moreover, Claims 1 and 10 each presently requires that the region that is friction stir welded extends from the surface of the work-piece into the work-piece to a depth that exceeds the depth of material that is caused to melt during the fusion welding process. It is clear from these claims that a part of the friction stir welded material is caused to melt during the fusion welding process, whereas another deeper part of the friction stir welded material is ***not*** caused to melt during the fusion welding process. That is also neither suggested nor taught by Forrest. Therefore, Forrest does not anticipate the limitations of independent claims 1, 9, 10, and 22.

With regard to claim 2, it should first be noted that the term "depth of the joint to be fusion welded" refers to the depth of the *joint*, which of course is typically measured in the same direction as the thickness of the work-piece, that is in the ST direction (see, for example, paragraphs 0052 and 0054 and Figures 1a to 1c). The claim has been carefully worded to cover situations in which, for example, (i) the surfaces to be welded and the thickness of the work-piece are non-parallel and/or (ii) a dual-pass weld is used (see paragraph 0021) - the thickness of the work-piece being up to twice the depth of the joint to be welded in this situation.

Furthermore, Applicant traverses the Examiner's contention that it is inherent for a process practiced with a FSW probe to join structural members having a joint depth greater than 50mm. It should be noted that Forrest does not describe *joining* structural members by way of a FSW step. The probe is merely used to refine the grain structure (see for example, col. 6, lines 49 to 52). Moreover, the depth of greater than 50mm mentioned in Claim 2 refers to the depth of the *joint* of the *fusion* weld, not the FSW weld, and in a direction that is typically transverse to the depth of the FSW weld. Thus claim 2 is not anticipated by Forrest.

The Examiner also rejects claims 1, 3, 4 and 6-16 under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,726,085 (Litwinski). Litwinski is no more relevant than Forrest however. As described above, the independent claims of the present application require a preparatory grain-refining treatment (for example a FSW treatment) followed by a fusion welding process, the preparatory treatment having been effected on the surface of *each* workpiece to be fusion welded to the other.

Litwinski describes an apparatus for performing FSW on a workpiece (see paragraph 0007). The apparatus includes a die (16) that is dimensioned to receive a workpiece, that

workpiece being urged through the die is such a way that a pin (28), housed in the die, stirs at least part of the workpiece. This refines the workpiece's grain structure (see paragraph 0066). While Litwinski discloses that a preform (26) (produced by the FSW extrusion technique taught by Litwinski) "can then be machined, using known machining methods, into a structural member that can be connected to other structural members using fasteners or welding techniques to form a structural assembly, such as the frame of an aerospace vehicle" (at column 15, lines 54 to 58), there is no suggestion or teaching that two workpieces should be joined by performing a FSW treatment on *each* workpiece and then joining the two workpieces by means of a fusion welding process. Also, insofar as claims 1, 10 and new claim 22 are concerned, Litwinski provides no suggestion that the region of fine grain structure extends into the work-piece to a depth that exceeds the depth of material caused to melt during a fusion welding process.

35 U.S.C. § 103(a)

The Examiner rejected claim 5 under 35 U.S.C. 103(a) over Litwinski and Forrest taken individually in view of Matsumoto (JP 2001-150155). Based on the foregoing arguments as to Forrest and Litwinski, the present rejection of obviousness is moot.

So as to further the prosecution of the above referenced application, Applicant has added claim 22 in light of Forrest and Litwinski. Claim 22 requires that a block of metal is formed by fusion welding together two or more treated workpieces, and the aircraft component is *then* machined from that block of metal, rather than forming two aircraft components and then welding together the aircraft components so formed.

In view of the foregoing, it is submitted that this application is in condition for allowance. Favorable consideration and prompt allowance of the application are respectfully requested.

The Examiner is invited to telephone the undersigned if the Examiner believes it would be useful to advance prosecution.

Respectfully submitted,

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